

2. "On the Influence of the Moon on the magnetic direction at Toronto, St. Helena, and Hobarton." By Colonel Edward Sabine, R.A., V.P. and Treas. Received Nov. 17, 1853.

Having noticed the inference drawn by M. Kreil from the magnetic observations at Milan and Prague, that the moon exercises an influence on the magnetic direction at the surface of our globe, cognisable by a variation in the declination depending on the moon's hour-angle and completing its period in a lunar day, the author proceeds in this paper to state the results of an examination, analogous to that pursued by M. Kreil, into the influence of the moon on the magnetic declination at the three stations of Toronto, St. Helena, and Hobarton.

The observations employed in this investigation consisted of six years of hourly observation at Toronto, five years at St. Helena, and five years at Hobarton, forming, exclusive of observations omitted on account of excessive disturbance, a total of 105,747 observations.

The processes are related by which, after the separation of the disturbances of largest amount, the observations were treated, for the purpose of eliminating the variations due to solar influence, and of re-arrangement in a form by which the inequality of the moon's action at the different hours of each lunar day might be brought distinctly into view. The results are shown in tables exhibiting the amount of inequality at each of the three stations corresponding to each of the twenty-four lunar hours.

It appears from these results that the existence of a lunar diurnal variation in the magnetic declination is shown at each of the three stations of Toronto, St. Helena, and Hobarton, and that it has the same general character at each, viz. that of a double progression in a lunar day, having two easterly maxima nearly at opposite points of the hour-circle, and two westerly maxima also at nearly two opposite points of the hour-circle. The extreme elongations are not at precisely opposite points of the hour-circle at any of the three stations, nor have the amounts of the two elongations which take place in the same direction always precisely the same value; but the slight inequalities in these respects are within the limits which might be ascribed to accidental variations, and might therefore disappear with longer continued observations. It is otherwise, however, in the author's opinion, with the disparity between the amounts of easterly and westerly extreme elongations which presents itself at each of the three stations. At Hobarton and St. Helena the westerly elongations have the larger values, at Toronto the easterly (the north end of the magnet being referred to in all cases).

The times at which the extreme elongations in the two directions take place are not the same at the three stations, and are as follows:—At Toronto the easterly extremes take place about the hours of 0 and 12, being the hours of the upper and lower culminations; at St. Helena the westerly extremes about two hours before the culminations; and at Hobarton about two hours after the culminations. At Toronto the westerly extremes take place about the hours of 6 and 18; at St. Helena and Hobarton the easterly extremes respect-

ively two hours before and two hours after the same hours of 6 and 18. The extreme inequality, or the amount of lunar variation measured from one extreme elongation to the other, is about  $28''$  of arc at Toronto,  $20''$  at Hobarton, and  $11''$  at St. Helena. The resolved portion of the terrestrial magnetic force which acts in the horizontal direction, and is opposed to any disturbing influence, is approximately 3.54 at Toronto, 4.51 at Hobarton, and 5.57 at St. Helena.

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November 24, 1853.

The EARL OF ROSSE, President, in the Chair.

The Earl of Harrowby was elected.

Captain Inglefield, R.N., was admitted into the Society.

The following gentlemen were elected Auditors of the Treasurer's Accounts on the part of the Society :—Capt. FitzRoy, Mr. Grove, Mr. Phillips, The Rev. Baden Powell, Mr. Wheatstone.

The following extract of a letter from Lieut. Gilliss, U.S.N. to Colonel Sabine, R.A., was read :—

Washington, 12 Sept. 1853.

Lieut. Mackai returned to the United States in April, having made his magnetical observations successfully at all the elevations and at distances of 100 miles, entirely across the Pampas. Soon after leaving Mendoza he was thrown from his horse, breaking his barometer and so injuring his chronometer, that he has neither the longitudes of his magnetical stations nor barometric profile of the country. Being desirous to make his work complete, he volunteered to retrace his ground, and left the United States for the purpose more than a month ago, taking with him the declinometer and dip-circle, two Bunten's barometers, an apparatus for determining altitudes from the boiling-point, and some smaller instruments.

Conveyance of the unifilar would have required another mule.

Cursory inspection of the observations already made afforded evidence of their reliability, and as repetition would have involved many hours' detention at each station, it was not considered essential to cumber him. Should the Argentine provinces have become sufficiently quiet, he will first cross the Andes at the Planchan Pass, lat.  $35^{\circ} 20'$ , next at the Partillo (the most elevated) Pass, lat.  $33^{\circ} 40'$ , and finally at the Cumbre and Uspalata Pass, in lat.  $32^{\circ} 50'$ , where observations have already been made.

As he will remain at Santiago only a short time, I look for him home during February next.

His and all the magnetical observations will then be discussed, and the volume be ready for press by the close of 1854. Those on meteorology are very far advanced.

The astronomical observations will fill three volumes, one of which (Mars and Venus) will be ready about the same time as the magnetical and meterological volume; the zones not until two years later.